

U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

FMVSS 216

Roof Crush Resistance —

Passenger Cars



ENFORCEMENT
Office of Vehicle Safety Compliance
Room 6115, NVS-221
400 Seventh Street, SW
Washington, DC 20590

REVISION CONTROL LOG
FOR OVSC LABORATORY
TEST PROCEDURES

TP-216
(Roof Crush Resistance)

TEST PROCEDURE		FMVSS 216		DESCRIPTION
REV. No.	DATE	AMENDMENT	EFFECTIVE DATE	
00				Original release signed by O.D.
01				
02				
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04	08/01/89	64FR54226	08/01/89	
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OVSC LABORATORY TEST PROCEDURE NO. 216

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1. PURPOSE AND APPLICATION

The Office of Vehicle Safety Compliance (OVSC) provides contracted laboratories with Laboratory Test Procedures (TPs) which serve as guidelines for obtaining compliance test data. The data are used to determine if a specific vehicle or item of motor vehicle equipment meets the minimum performance requirements of the subject Federal Motor Vehicle Safety Standard (FMVSS). The purpose of the OVSC Laboratory Test Procedures (TPs) is to present a uniform testing and data recording format, and provide suggestions for the use of specific equipment and procedures. Any contractor interpreting any part of an OVSC Laboratory Test Procedure to be in conflict with a Federal Motor Vehicle Safety Standard or observing any deficiencies in a Laboratory Test Procedure (TP) is required to advise the Contracting Officer's Technical Representative (COTR) and resolve the discrepancy prior to the start of compliance testing.

Contractors are required to submit a detailed test procedure to the COTR before initiating the compliance test program. The procedure must include a step-by-step description of the methodology to be used.

The OVSC Laboratory Test Procedures are not intended to limit or restrain a contractor from developing or utilizing any testing techniques or equipment which will assist in procuring the required compliance test data.

NOTE:

The OVSC Laboratory Test Procedures, prepared for use by independent laboratories under contract to conduct compliance tests for the OVSC, are not intended to limit the requirements of the applicable FMVSS(s). In some cases, the OVSC Laboratory Test Procedures do not include all of the various FMVSS minimum performance requirements. Sometimes, recognizing applicable test tolerances, the Test Procedures specify test conditions which are less severe than the minimum requirements of the standards themselves. Therefore, compliance of a vehicle or item of motor vehicle equipment is not necessarily guaranteed if the manufacturer limits certification tests to those described in the OVSC Laboratory Test Procedures.

2. GENERAL REQUIREMENTS

FMVSS 216, Roof Crush Resistance — Passenger Cars, establishes strength requirements for the passenger compartment roof. The purpose of the standard is to reduce deaths and injuries due to the crushing of the roof into the passenger compartment in rollover accidents. The standard does not apply to passenger cars that conform to the dynamic rollover test requirements of FMVSS 208, Occupant Crash Protection, paragraph 5.3 by means that require no action by passenger car occupants. It also does not apply to convertibles, except for optional compliance with the standard as an alternative to the rollover test requirements in paragraph 5.3 of FMVSS 208.

A test device (rigid unyielding block with its lower surface formed as a flat rectangle 30 inches by 72 inches) shall not move more than 5 inches, measured as the distance between the original location of the lower surface of the test device and its location as the specified force level is reached, when it is used to apply a force of 1-1/2 times the unloaded vehicle weight (UVW) or 5,000 lbs., whichever is LESS, to either side or the forward edge of the vehicle's. Both the left and right front portions of the vehicle's roof structure shall be capable of meeting the requirements, but a particular passenger car need NOT meet further requirements after being tested at one location. The passenger car's sills or the chassis frame shall be placed on a rigid horizontal surface and fixed rigidly in position. The vehicle's windows shall be CLOSED and the doors shall be LOCKED. Any convertible top or removable roof structure shall be secured in place over the passenger compartment.

The force shall be applied in a downward direction perpendicular to the lower surface of the test device at a rate of not more than 1/2 inch per second until reaching a force of 1-1/2 times the UVW or 5,000 pounds (whichever is LESS). The test shall be completed within 120 seconds. The test device shall be guided throughout the test so that it moves, without rotation, in a straight line with its lower surface oriented as follows and as shown in Figures 1 and 2 on the next page:

- A. Its longitudinal axis is at a forward angle (side view) of 5° below the horizontal, and is parallel to the vertical plane through the vehicle's longitudinal centerline.
- B. Its lateral axis is at a lateral outboard angle, in the front view projection, 25° below the horizontal.
- C. Its lower surface is tangent to the surface of the vehicle.
- D. The initial contact point, or center of the initial contact area, is on the longitudinal centerline of the lower surface of the test device and 10 inches from the forwardmost point of the centerline.

2. GENERAL REQUIREMENTS....Continued

LOADING DEVICE LOCATION AND APPLICATION TO THE ROOF

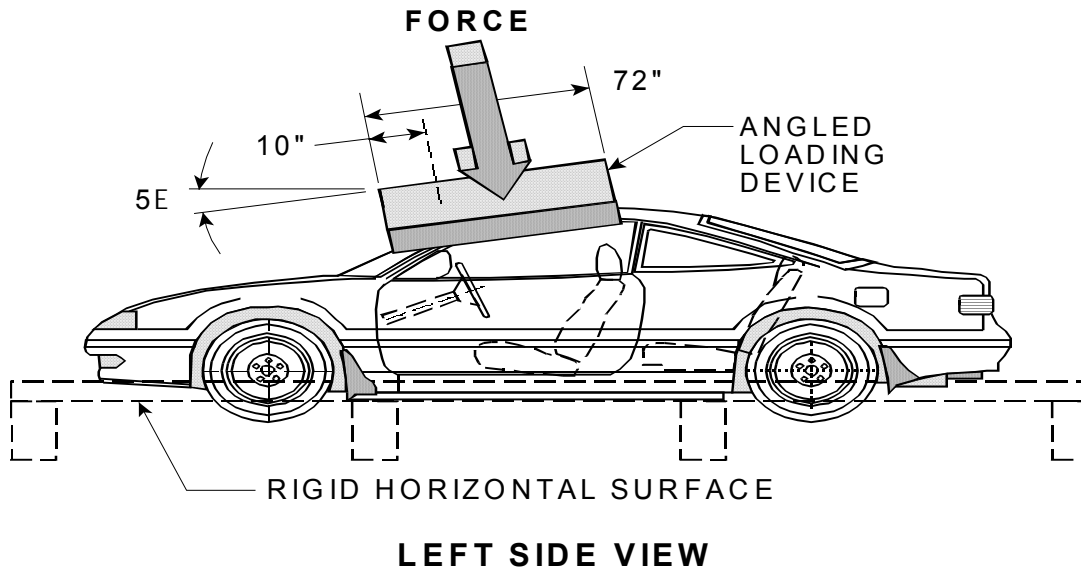


FIGURE 1

LOADING DEVICE LOCATION AND APPLICATION TO THE ROOF

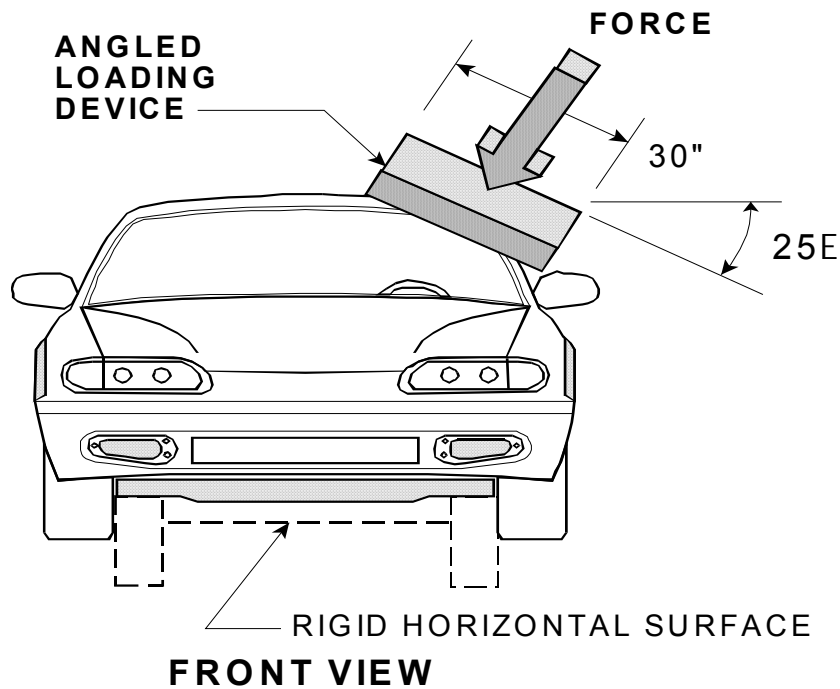


FIGURE 2

3. SECURITY

The contractor shall provide appropriate security measures to protect the OVSC test vehicles from unauthorized personnel during the entire compliance testing program. The contractor is financially responsible for any acts of theft and/or vandalism which occur during the storage of test vehicles. Any security problems which arise shall be reported by telephone to the Industrial Property Manager (IPM), Office of Contracts and Procurement, within two working days after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within 48 hours.

The contractor shall protect and segregate the data that evolves from compliance testing before and after each vehicle test. No information concerning the vehicle safety compliance testing program shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Branch or Division Chief.

NO INDIVIDUALS, OTHER THAN CONTRACTOR PERSONNEL DIRECTLY INVOLVED IN THE COMPLIANCE TESTING PROGRAM, SHALL BE ALLOWED TO WITNESS ANY VEHICLE COMPLIANCE TEST UNLESS SPECIFICALLY AUTHORIZED BY THE COTR.

4. GOOD HOUSEKEEPING

Contractors shall maintain the entire vehicle compliance testing area, test fixtures and instrumentation in a neat, clean and painted condition with test instruments arranged in an orderly manner consistent with good test laboratory housekeeping practices.

5. TEST SCHEDULING AND MONITORING

The contractor shall submit a test schedule to the COTR prior to testing. Tests shall be completed as required in the contract. Scheduling shall be adjusted to permit sample motor vehicles to be tested to other FMVSS as may be required by the OVSC. All testing shall be coordinated to allow monitoring by the COTR.

6. TEST DATA DISPOSITION

The contractor shall make all vehicle preliminary compliance test data available to the COTR on location within four hours after the test. Final test data, including digital printouts and computer generated plots (if applicable), shall be furnished to the COTR within five working days. Additionally, the contractor shall analyze the preliminary test results as directed by the COTR.

All backup data sheets, strip charts, recordings, plots, technicians notes, etc., shall be either sent to the COTR or destroyed at the conclusion of each delivery order, purchase order, etc.

7. GOVERNMENT FURNISHED PROPERTY (GFP)

ACCEPTANCE OF TEST VEHICLES

The Contractor has the responsibility of accepting test vehicles from either new car dealers or vehicle transporters. In both instances, the contractor acts in the OVSC's behalf when signing an acceptance of test vehicles. If a vehicle is delivered by a dealer, the contractor must check to verify the following:

- A. All options listed on the "window sticker" are present on the test vehicle.
- B. Tires and wheel rims are the same as listed.
- C. There are no dents or other interior or exterior flaws.
- D. The vehicle has been properly prepared and is in running condition.
- E. The glove box contains an owner's manual, warranty document, consumer information, and extra set of keys.
- F. Proper fuel filler cap is supplied on the test vehicle.

If the test vehicle is delivered by a government contracted transporter, the contractor should check for damage which may have occurred during transit.

A "Vehicle Condition" form will be supplied to the contractor by the COTR when the test vehicle is transferred from the new car dealer or between test contracts. The upper half of the form describes the vehicle in detail, and the lower half provides space for a detailed description of the post test condition. Vehicle Condition forms must be returned to the COTR with the copies of the Final Test Report or the reports will NOT be accepted.

NOTIFICATION OF COTR

The COTR must be notified within 24 hours after a vehicle has been delivered.

8. CALIBRATION OF TEST INSTRUMENTS

Before the contractor initiates the safety compliance test program, a test instrumentation calibration system will be implemented and maintained in accordance with established calibration practices. Guidelines for setting up and maintaining such calibration systems are described in MIL-C-45662A, "Calibration System Requirements". The calibration system shall be setup and maintained as follows:

- A. Standards for calibrating the measuring and test equipment will be stored and used under appropriate environmental conditions to assure their accuracy and stability.
- B. All measuring instruments and standards shall be calibrated by the contractor, or a commercial facility, against a higher order standard at periodic intervals NOT TO EXCEED TWELVE (12) MONTHS! Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.
- C. All measuring and test equipment and measuring standards will be labeled with the following information:
 - (1) Date of calibration
 - (2) Date of next scheduled calibration
 - (3) Name of the technician who calibrated the equipment
- D. A written calibration procedure shall be provided by the contractor which includes as a minimum the following information for all measurement and test equipment:
 - (1) Type of equipment, manufacturer, model number, etc.
 - (2) Measurement range
 - (3) Accuracy
 - (4) Calibration interval
 - (5) Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)
- E. Records of calibration for all test instrumentation shall be kept by the contractor in a manner which assures the maintenance of established calibration schedules. All such records shall be readily available for inspection when requested by the COTR. The calibration system will need the acceptance of the COTR before the test program commences.

9. PHOTOGRAPHIC DOCUMENTATION

Photographs shall be black and white, 8 x 10 inches, and legible. A tag, label or placard identifying the test vehicle model and NHTSA number shall appear in each photograph and be legible. Each photograph shall be labeled as to subject matter. As a minimum the following photographs shall be included:

- A. 3/4 forward view on the tested side of the vehicle before testing.
- B. 3/4 forward view on the tested side of the vehicle after testing.
- C. 3/4 rearward view on the tested side of the vehicle before testing.
- D. 3/4 rearward view on the tested side of the vehicle after testing.
- E. Full view of left side of vehicle before testing.
- F. Full view of left side of vehicle after testing.
- G. Full view of right side of vehicle before testing.
- H. Full view of right side of vehicle after testing.
- I. Photo of loading device placed against vehicle's roof at beginning of test.
- J. Photo of loading device placed against vehicle's roof at maximum load condition.
- K. Photo of instrumentation setup.
- L. Roof, after removal of loading device, viewed from the vehicle exterior.
- M. Roof, after removal of loading device, viewed from the vehicle interior.
- N. Any damage not shown in above photos.
- O. Include all backup photographs.
- P. Closeup view of vehicle's certification label.
- Q. Closeup view of vehicle's tire information placard or label.

10. DEFINITIONS

LONGITUDINAL OR LONGITUDINALLY

Parallel to the vehicle's longitudinal centerline.

UNLOADED VEHICLE WEIGHT (UVW)

The weight of a vehicle with maximum capacity of all fluids necessary for operation of the vehicle, but WITHOUT cargo or occupants.

CURB WEIGHT

The weight of a motor vehicle with standard equipment; maximum capacity of engine fuel, oil, coolant; and, if so equipped, air conditioning and additional weight optional engine.

GROSS VEHICLE WEIGHT RATING (GVWR)

The value specified by the manufacturer as the loaded weight of a single vehicle.

GROSS AXLE WEIGHT RATING (GAWR)

The value specified by the vehicle manufacturer as the load-carrying capacity of a single axle system, as measured at the tire-ground interfaces.

11. PRETEST REQUIREMENTS

Prior to conducting any compliance tests, contractors are required to submit a detailed in-house compliance test procedure to the COTR which includes a step-by-step description of the methodology to be used. Written approval must be obtained from the COTR before initiating the compliance test program so that all parties are in agreement.

The contractor's test procedure shall contain a complete listing of test equipment and a detailed check-off list. There shall be no contradiction between the OVSC Laboratory Test Procedure and the contractor's in-house test procedure. The list of test equipment shall include instrument accuracy and calibration dates.

TEST DATA LOSS

A compliance test is not to be conducted unless all of the various test conditions specified in the applicable OVSC Laboratory Test Procedure have been met. Failure of a contractor to obtain the required test data and to maintain acceptable limits on test parameters (such as impact velocity) in the manner outlined in the applicable OVSC Laboratory Test Procedure may require a retest at the expense of the contractor. The retest costs will include the cost of the replacement vehicle (with the same equipment as the original vehicle) or item of motor vehicle equipment and all costs associated with conducting the retest. The original test specimen (vehicle or equipment item) used for the invalid test shall remain the property of OVSC, and the retest specimen shall remain the property of the contractor. If there is a test failure, the contractor shall retain the retest specimen for a period not exceeding 180 days. If there is no test failure, the Contractor may dispose of the test specimen upon notification from the COTR that the final test report has been accepted.

The Contracting Officer of NHTSA is the only NHTSA official authorized to notify the contractor that a retest is required. The retest shall be completed within two (2) weeks after receipt of notification by the Contracting Officer that a retest is required. If a retest is conducted, no test report is required for the original test.

12. COMPLIANCE TEST EXECUTION

TEST EQUIPMENT

Following is a list of the minimum test equipment needed to evaluate the minimum performance requirements as outlined in S216.

A. Static Loading Device

The Loading Device will consist of a rigid, unyielding block with its lower surface formed as a flat rectangle 30 inches by 72 inches. The load may be applied either mechanically or hydraulically. Any fixture weight that would be supported by the vehicle prior to load application shall be counterbalanced to prevent it from influencing the test loads.

B. Vehicle Tie-Down Fixture

The vehicle must be secured on a rigid, horizontal fixture ($\pm 0.25^\circ$) so that it is adequately restrained at the vehicle underbody, supported along the entire length of the sills of the vehicle and at the sides to prevent lateral and/or rotational movement of the body during the test. Good engineering judgement will be required to provide maximum support. Following are some examples of different types of vehicle construction that may be encountered:

- (1) Separate body and frame construction.
- (2) Full unit body construction.
- (3) Unit body construction and stub frame construction.
- (4) Other types of construction.

The vehicle shall be secured to the loading fixture using wire rope, turnbuckles, strap plates, jackstands, etc. As many horizontal and vertical tie-downs will be used as needed to prevent movement under load. The tie-downs will be located lower than any window opening so as not to affect the stiffness of the roof.

C. Load Measuring Device

A load cell of proper capacity with an accuracy of ± 0.25 percent shall be used for measuring load and will be placed in the loading system so that it measures the actual load being transmitted into the vehicle roof. As a backup, a second load measuring device, such as a pressure gauge in the case of hydraulic load application, or a suitable instrument in the case of mechanical load application, should be used. If a pressure gauge is used, it should be placed as close as possible to the hydraulic load applying device. The backup device for a mechanical system should be attached so as not to detract from the applied load.

12. COMPLIANCE TEST EXECUTION....Continued

D. Deflection Measuring Device

Deflection of the loading device shall be measured to ± 0.0625 inch using a linear displacement potentiometer fixed at one end and attached to the loading device at the opposite end. A machinist scale should also be used as a backup system.

E. Body Deflection Measuring Device

Two dial indicators, with an accuracy of ± 0.001 inch, and a minimum of one inch of travel shall be placed on a vertical line parallel to a vertical line through the initial contact point of the loading device on the vehicle roof. The dial indicators shall be located on the door opposite the side of the vehicle's roof edge being tested. One shall be two inches above the lowest point of the door and one shall be two inches below the door window opening along the vertical line. If required, the highest and lowest points of the door may be projected to determine the attachment points of the dial indicators. Readings shall be taken before loading, at maximum loading device travel, and immediately after removal of the loading device.

F. Recording System

(1) Deflection vs. Load

An X-Y plotter, with an accuracy of ± 1 percent, shall be used to plot a load versus deflection graph as a permanent record. The graph paper shall have an overall size of 8-1/2 by 11 inches and shall have an effective area of 7 by 10 inches. Force will be plotted in the vertical axis with each inch equal to 1,000 pounds. Displacement will be plotted on the horizontal axis with each inch equal to 0.50 inch.

(2) Deflection vs. Time

An X-Y plotter, with an accuracy of ± 1 percent, shall be used to plot deflection versus time to insure appropriate rate of load application. The graph paper shall have an overall size of 8-1/2 by 11 inches and shall have an effective area of 7 by 10 inches. Time will be plotted in the vertical axis with each inch equal to 20 seconds. Displacement will be plotted on the horizontal axis with each inch equal to 0.50 inch. An oscillator will provide the time base, and a stop watch will be used as a backup system.

12. COMPLIANCE TEST EXECUTION....Continued

G. Miscellaneous Measuring Devices

Appropriate angle and length measuring instruments for determination of the orientation of the loading device and test vehicle, scales for weighing the test vehicle, and length measuring instruments for determination of the crush resistance shall be used. Scales for weighing the vehicle shall have an accuracy of ± 40 pounds when the entire vehicle is weighted.

H. Photographic Equipment

Provide cameras and lights necessary for photographs of each test setup, test vehicle, instrumentation, and the backup systems.

I. Temperature Measuring Device

A temperature measuring instrument with an accuracy of ± 1 degree shall be used to measure the ambient temperature 2 inches from the roof in the immediate area of the loading device. This measurement will be taken immediately prior to test initiation.

PRETEST PREPARATION

A. WASH AND CLEAN

Wash and clean the vehicle. Inspect test vehicle per receiving inspection procedures to ascertain completeness, function, and operation. Record and notify the COTR of any abnormal conditions that could influence the test results.

B. VEHICLE PREPARATION

Prior to securing the vehicle to the test fixture, the following will be accomplished:

- (1) Weigh vehicle
- (2) Secure any convertible top or removable roof structure in place.
- (3) Remove any components of vehicle that may interfere or prevent the vehicle sills and/or frame from being supported on the tie-down fixture.

C. SECURE THE VEHICLE

Secure the test vehicle in the tie-down fixture. Attachments of wire rope, turnbuckles, etc. will be made by using existing holes, etc. in the sill, frame or body. Note that a sufficient number of horizontal and vertical tie-down located below all window openings, shall be used to prevent lateral or longitudinal movement under load. Unyielding vertical faces shall be used opposite the side being loaded, and across the rear of the vehicle, to support the sill, frame, or body to prevent movement.

12. COMPLIANCE TEST EXECUTION....Continued

TEST EQUIPMENT ACCURACY

EQUIPMENT ITEM	RANGE	ACCURACY
Hydraulic Ram	0 - 120% of specified load	N/A
Load Cell and Signal Conditioner	0 - 120% of specified load	± 5%
X-Y Plotter (2)	Readout Capability 120% of Maximum load	± 1%
Oscillator	1 MHz	+ 1%
DC Power Supply	Adequate for Load Cell Used	Line Reg. of 0.05% (105-125v) Load Reg. of 0.05% (0-Full) Ripple: .5mv P/P Stability: 0.1%
Digital Voltmeter of Equivalent Used to Monitor Load Cell Outputs	4 Digit Readout	± 0.1%
Signal Conditioning and Calibration Unit(s)	Adequate for Load Cells Used	± 0.5%
Inclinometer	360°	+ 0.25°
Linear Displacement Potentiometer	6 inches	+ 0.25%
Steel Scale	At least 6 Inches	0.1"
Pressure Gage	Adequate for pressure required	± 2%
Dial Indicators (2)	At least 1 inch travel	± 0.001"
Stop Watch	N/A	+ 0.1 Seconds
Temperature Measuring Device	0° - 120°F	± 1°F
Scale	0 - 2500 lbs./wheel	+ 10 lbs/wheel

D. TEST ENVIRONMENT

The vehicle test will be performed within an enclosed structure. Precautions will be taken to eliminate any heat sources that could cause temperature build-up within the closed vehicle above the ambient of the testing enclosure.

12. COMPLIANCE TEST EXECUTION....Continued

E. MOUNT THE LOADING DEVICE

Position the loading device as shown on the next page so that:

- (1) Its longitudinal axis is at a forward angle (side view) of 5° plus zero, minus $20'$ below the horizontal, and is paralleled to the vertical plane through the vehicle's longitudinal centerline;
- (2) Its lateral axis is at a lateral outboard angle, in the front view projection, of 25° plus zero, minus 1° below the horizontal;
- (3) Its lower surface is tangent to the surface of the vehicle; and
- (4) The initial contact point, or center of the initial contact area, is on the longitudinal centerline of the lower surface of the test device and 10 inches from the forwardmost point of that centerline.

Any part of the loading device that may contact the roof shall meet the angular requirements stated above. A block diagram of a typical instrumentation and loading device setup is shown in Figure 3 on the next page.

F. PRETEST PHOTOGRAPHS

Take the required pretest photographs.

STATIC LOAD TEST

The roof of any vehicle shall be tested on one side only. The left or right side of the vehicle may be tested. The test shall be performed at an ambient temperature between 15° and 110°F . Record the ambient temperature 2 inches from the vehicle roof in the immediate area of the loading device and close all windows and lock doors immediately prior to testing.

A. DATA ACQUISITION

The following data will be recorded during testing of each vehicle roof:

- (1) Load versus displacement.
- (2) Time versus displacement

As a backup to these plots, the following will be photographed, in loading device travel, in the same field of view:

- (1) Pressure gauge or dynamometer (load backup).
- (2) Steel tape measure (displacement backup).
- (3) Clock (time backup).

12. COMPLIANCE TEST EXECUTION....Continued

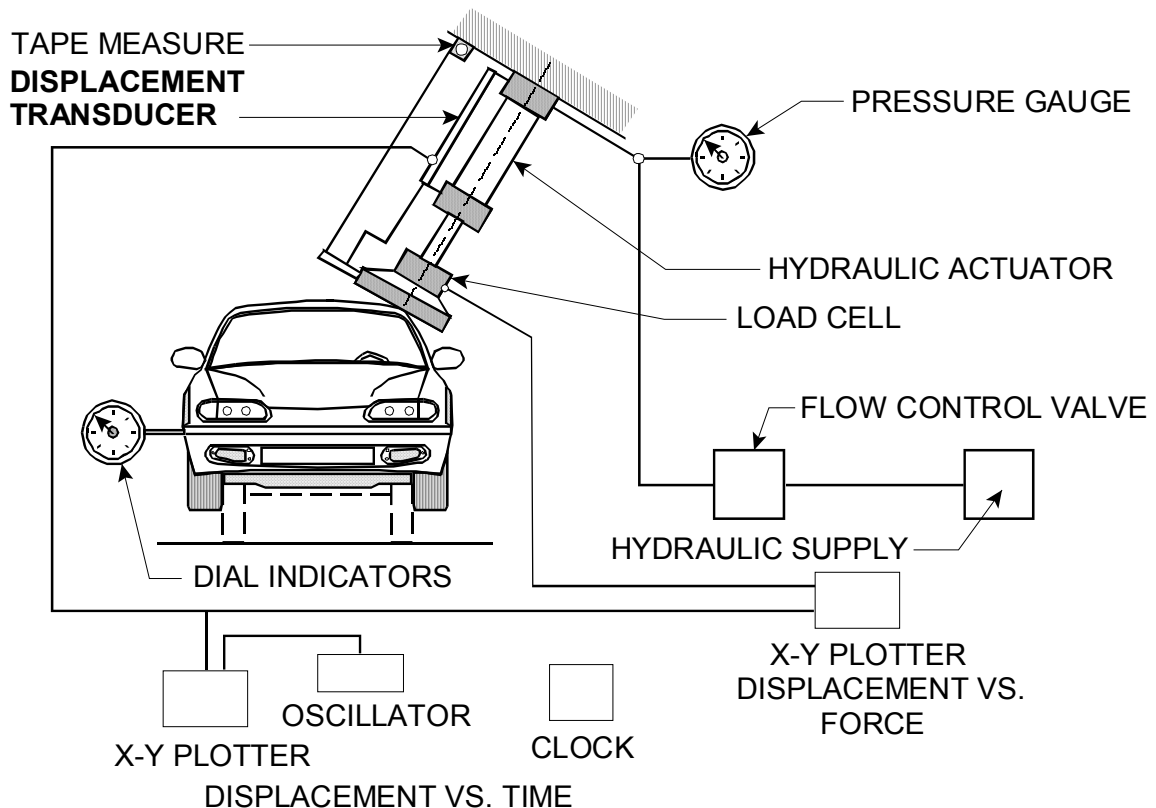
BLOCK DIAGRAM - TYPICAL INSTRUMENTATION SETUP

FIGURE 3

- (4) The two dial indicators, which show deflection on the side of the vehicle opposite to the side the vehicle being crushed. As a minimum, they shall be photographed.
- (A) Before load application.
 - (B) At maximum displacement of loading device travel.
 - (C) Immediately after loading device removal.

B. CRUSH RESISTANCE

Apply a load to the roof normal to the 30 inch by 72 inch loading device after it has been positioned. Apply the load continuously at a rate not to exceed 1/2 inch per second until the loading device travels 5 inches. Guide the loading device to prevent it from being rotated or displaced from its intended direction of travel. The loading device will have the capability of traveling a MINIMUM of 6 inches after initial contact with the roof. The test must be COMPLETED WITHIN 120 SECONDS. If the minimum roof crush resistance is met before the loading device travels 5 inches, the test shall be stopped.

12. COMPLIANCE TEST EXECUTION....Continued

Minimum — The minimum roof crush resistance shall be 1-1/2 times the UVW or 5,000 pounds, whichever is LESS.

A test log shall be maintained for each test vehicle or group of vehicles. The log shall include a description of the testing performed on a daily basis, including summary of test results and any pertinent information regarding the status of the test vehicle.

13. POST TEST REQUIREMENTS

The contractor shall re-verify all instrumentation and check data sheets and photographs.

VISUAL OBSERVATIONS

The following information shall be recorded after testing of the roof:

Describe all damage and deformation to the roof and vehicle.

Take the required post test photographs.

MEASUREMENTS

To determine the roof crush resistance, use the plot of load versus displacement and directly obtain the following information:

Distance of loading device travel for which minimum roof crush resistance was obtained and the minimum roof crush resistance.

The maximum roof crush resistance obtained and the distance of loading device travel when it was obtained.

Two typical test curves of FORCE VS. DISPLACEMENT and TIME VS. DISPLACEMENT are shown in Figures 4 and 5 on the next page.

12. COMPLIANCE TEST EXECUTION....Continued

TYPICAL FORCE VS. DISPLACEMENT CURVE

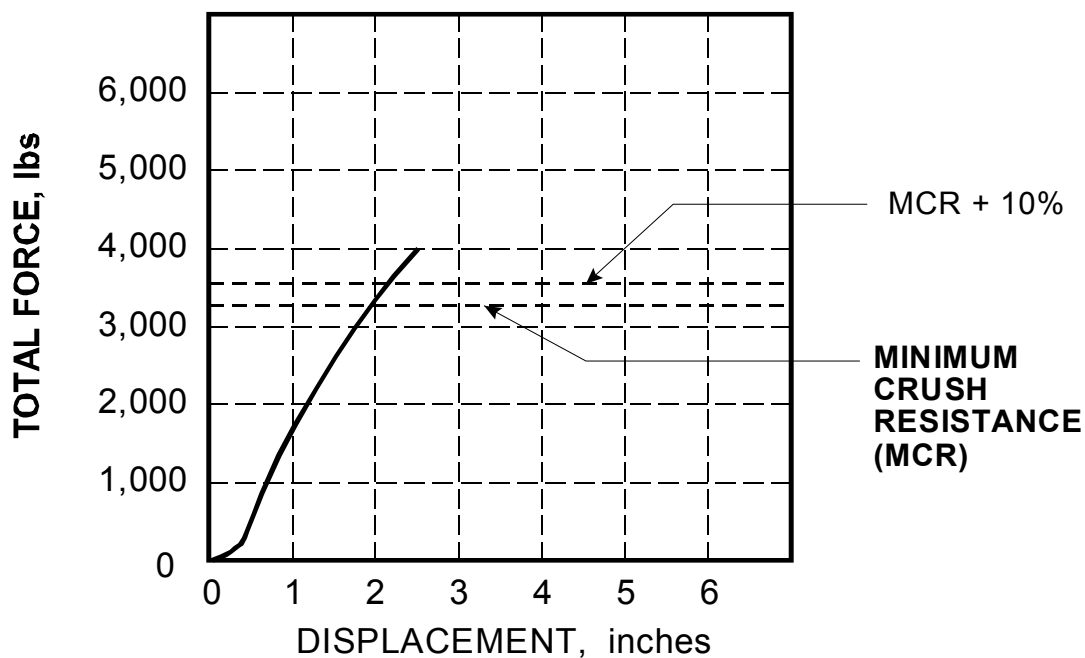
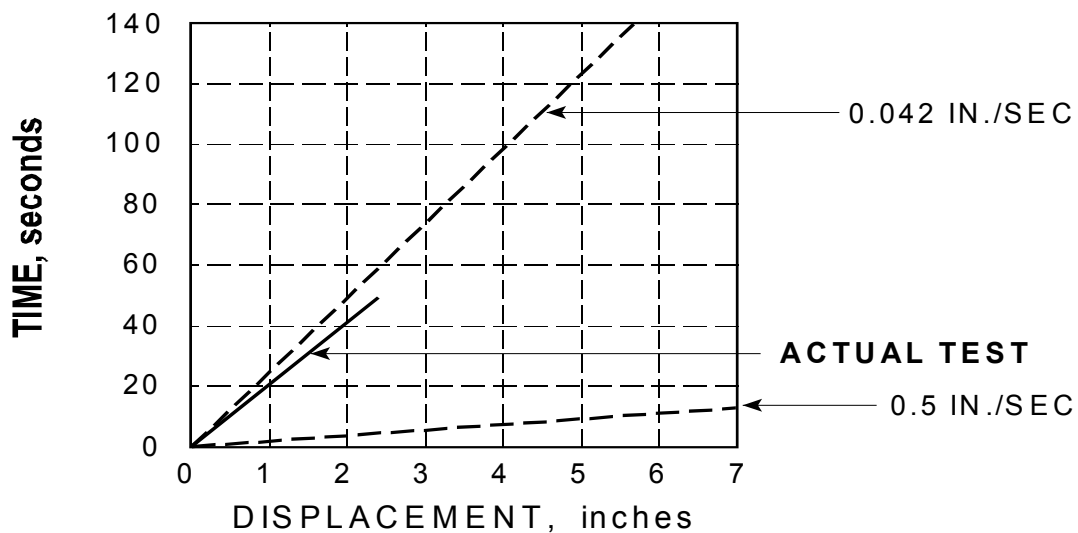


FIGURE 4

TYPICAL DISPLACEMENT VS. TIME CURVE



MAXIMUM Allowable Rate = 0.5 in./sec.
MINIMUM Allowable Rate = 0.042 in./sec.

FIGURE 5

14. REPORTS

14.1 MONTHLY STATUS REPORTS

The contractor shall submit a monthly Test Status Report and a Vehicle or Equipment Status Report to the COTR. The Vehicle or Equipment Status Report shall be submitted until all vehicles or items of equipment are disposed of. Samples of the required Monthly Status Reports are contained in the report forms section.

14.2 APPARENT NONCOMPLIANCE

Any indication of a test failure shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturdays and Sundays excluded). A Notice of Test Failure (see report forms section) with a copy of the particular compliance test data sheet(s) and preliminary data plot(s) shall be included. In the event of a test failure, a post test calibration check of some critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration shall be at the COTR's discretion and shall be performed without additional costs to the OVSC.

14.3 FINAL TEST REPORTS

14.3.1 COPIES

In the case of a test failure, **SEVEN** copies of the Final Test Report shall be submitted to the COTR for acceptance within three weeks of test completion. The Final Test Report format to be used by all contractors can be found in the "Report Section".

Where there has been no indication of a test failure, **FOUR** copies of each Final Test Report shall be submitted to the COTR within three weeks of test completion. Payment of contractor's invoices for completed compliance tests may be withheld until the Final Test Report is accepted by the COTR. Contractors are requested to NOT submit invoices before the COTR is provided copies of the Final Test Report.

Contractors are required to submit the first Final Test Report in draft form within two weeks after the compliance test is conducted. The contractor and the COTR will then be able to discuss the details of both test conduct and report content early in the compliance test program. Contractors are required to PROOF READ all Final Test Reports before submittal to the COTR. The OVSC will not act as a report quality control office for contractors. Reports containing a significant number of errors will be returned to the contractor for correction, and a "hold" will be placed on invoice payment for the particular test.

14. REPORTS....Continued

14.3.2 REQUIREMENTS

The Final Test Report, associated documentation (including photographs) are relied upon as the chronicle of the compliance test. The Final Test Report will be released to the public domain after review and acceptance by the COTR. For these reasons, each final report must be a complete document capable of standing by itself.

The contractor should use **detailed** descriptions of all compliance test events. Any events that are not directly associated with the standard but are of technical interest should also be included. The contractor should include as much **detail** as possible in the report.

Instructions for the preparation of the first three pages of the final test report are provided below for the purpose of standardization.

14.3.3 FIRST THREE PAGES

A. FRONT COVER —

A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

- (1) Final Report Number such as 216-ABC-9X-001 where
 216 is the FMVSS tested
 ABC are the initials for the laboratory
 9X is the Fiscal Year of the test program
 001 is the Group Number (001 for the 1st test,
 002 for the 2nd test, etc.)

- (2) Final Report Title And Subtitle such as

SAFETY COMPLIANCE TESTING FOR FMVSS 216
 Roof Crush Resistance —
 Passenger Cars
 * * * * *

World Motors Corporation
 199X Ace Super Coupe
 NHTSA No. CX0401

- (3) Contractor's Name and Address such as

COMPLIANCE TESTING LABORATORIES, INC.
 4335 West Dearborn Street
 Detroit, Michigan 48090

14. REPORTS....Continued

NOTE: DOT SYMBOL WILL BE PLACED BETWEEN ITEMS (3) AND (4)

- (4) Date of Final Report completion
- (5) The words "FINAL REPORT"
- (6) The sponsoring agency's name and address as follows

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
ENFORCEMENT
Office of Vehicle Safety Compliance
400 Seventh Street, SW
Room 6115 (NVS-220)
Washington, DC 20590

14. REPORTS....Continued**B. FIRST PAGE AFTER FRONT COVER —**

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Prepared By: _____

Approved By: _____

Approval Date: _____

FINAL REPORT ACCEPTANCE BY OVSC:

Accepted By: _____

Acceptance Date: _____

14. REPORTS....Continued

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Block 1 — REPORT NUMBER

216-ABC-9X-001

Block 2 — GOVERNMENT ACCESSION NUMBER

Leave blank

Block 3 — RECIPIENT'S CATALOG NUMBER

Leave blank

Block 4 — TITLE AND SUBTITLE

Final Report of FMVSS 216 Compliance Testing of 199X Ace Super Coupe, NHTSA No. CX0401

Block 5 — REPORT DATE

March 1, 199X

Block 6 — PERFORMING ORGANIZATION CODE

ABC

Block 7 — AUTHOR(S)

John Smith, Project Manager / Bill Doe, Project Engineer

Block 8 — PERFORMING ORGANIZATION REPORT NUMBER

ABC-DOT-XXX-001

Block 9 — PERFORMING ORGANIZATION NAME AND ADDRESS

ABC Laboratories
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Detroit, MI 48070-1234

14. REPORTS....Continued**Block 10 — WORK UNIT NUMBER**

Leave blank

Block 11 — CONTRACT OR GRANT NUMBER

DTNH22-9X-D-12345

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US Department of Transportation
National Highway Traffic Safety Administration
ENFORCEMENT
Office of Vehicle Safety Compliance (NVS-220)
400 Seventh Street, SW, Room 6115
Washington, DC 20590

Block 13 — TYPE OF REPORT AND PERIOD COVERED

Final Test Report
Feb. 15 to Mar. 15, 199X

Block 14 — SPONSORING AGENCY CODE

NVS-220

Block 15 — SUPPLEMENTARY NOTES

Leave blank

Block 16 — ABSTRACT

Compliance tests were conducted on the subject 199X Ace Super 2-door coupe in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-216-0X for the determination of FMVSS 216 compliance. Test failures identified were as follows:

None

NOTE: Above wording must be shown with appropriate changes made for a particular compliance test. Any questions should be resolved with the COTR.

14. REPORTS....Continued**Block 17 — KEY WORDS**

Compliance Testing
Safety Engineering
FMVSS 216

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Leave blank

14. REPORTS....Continued

14.3.4 TABLE OF CONTENTS

Final test report Table of Contents shall include the following:

- A. Section 1 — Purpose of Compliance Test
- B. Section 2 — Compliance Data Summary
- C. Section 3 — Test Data
- D. Section 4 — Test Equipment List and Calibration Information
- E. Section 5 — Photographs
- F. Section 6 — Notice of Test Failure (if applicable)

15. DATA SHEETS**DATA SHEET 1****SUMMARY OF RESULTS**

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____
_____**A. VISUAL INSPECTION OF SAMPLE**

Upon receipt for completeness, function, and discrepancies or damage which might influence the testing.

RESULTS:

B. STATIC LOAD TEST OF _____ SIDE OF ROOF	PASS	FAIL
(1) Minimum Roof Crush Strength of _____ lbs. at _____ inches.	_____	_____
Minimum of 1-1/2 times UVW or 5,000 pounds (WHICHEVER IS LESS) at or before 5 inches.		
(2) Maximum Roof Crush Strength of _____ lbs. pounds at _____ inches.	_____	_____

15. DATA SHEETS....Continued

(3) The unloaded vehicle weight was ____ pounds.

C. POST TEST VISUAL INSPECTION

Briefly describe any damages or failures and general vehicle condition upon completion of testing.

RESULTS:

REMARKS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued**DATA SHEET 2
RECEIVING INSPECTION**

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____

Upon receipt, the vehicle will be examined visually for completeness, function, and damage. The roof and supporting structures such as the doors and windows should be checked for proper operation and any discrepancies which may influence the testing. The vehicle will be weighed and the minimum roof crush resistance determined.

RESULTS:**(1) Unloaded Vehicle Weight (UVW):**

Left Front _____ lbs. Left Rear _____ lbs.

Right Front _____ lbs. Right Rear _____ lbs.

Front Axle _____ lbs. Rear Axle _____ lbs.

TOTAL UVW _____ lbs.

(2) Minimum Roof Crush Resistance: _____**(3) Other Comments: _____**

REMARKS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued**DATA SHEET 3****PRETEST PREPARATION**

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____

Prior to testing, the following will be accomplished:

- A. Secure any convertible top or removable roof structure in place _____

- B. Close all windows _____
- C. Lock all doors _____
- D. State side of roof tested _____
- E. Measure the lateral angle of the loading device at sufficient points to determine that it has a $25^{\circ} +0^{\circ}$, -1° angle _____

(See Continuation Data Sheet)
- F. Measure the longitudinal angle of the loading device at sufficient points to determine that it has a $5^{\circ} +0^{\circ}$, $-20'$ angle _____

(See Continuation Data Sheet)
- G. The roof will initially contact the loading device at _____

15. DATA SHEETS....Continued

H. Ambient temperature two inches from the vehicle roof in the immediate area of the loading device: _____°F.

REMARKS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued**DATA SHEET 4****STATIC LOAD TEST****BACKUP SYSTEM DATA**

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____

While performing the Static Load Test, data from the backup systems shall be photographed to verify the performance of the primary instrumentation setup.

RESULTS: Plots of load versus displacement and time versus displacement obtained from the backup data (attach plots to data sheet) showed that:

- (1) The minimum roof crush resistance was _____ at _____ inches.
- (2) The maximum roof crush resistance was _____ at _____ inches.
- (3) The rate of loading was _____

The dial indicators on the opposite side from the roof test side showed the following deflections:

LOADING DEVICE TRAVEL	DIAL INDICATOR TOP OF DOOR	DIAL INDICATOR BOTTOM OF DOOR
Before load application	_____	_____
At maximum loading device travel of _____ inches.	_____	_____
Immediately after removal of loading device.	_____	_____

15. DATA SHEETS....Continued

REMARKS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued**DATA SHEET 5****POST TEST VISUAL INSPECTION**

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____

Upon completion of testing, a detailed visual inspection of the vehicle shall be made. Describe all damage and deformation that occurred during the test.

RESULTS:

REMARKS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued**DATA SHEET 6****DATA REDUCTION**

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____

Data from the primary data systems will be analyzed and the plots attached to the data sheet.

RESULTS: The load versus displacement plot showed that:

(1) The minimum roof crush resistance was ____ at ____ inches.

(2) The maximum roof crush resistance was ____ at ____ inches.

The time versus displacement plot showed that the rate of loading was _____

Comparison of the above data with the backup data from Data Sheet No. 4 indicates:

REMARKS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued**DATA SHEET 7****CONTINUATION AND GENERAL DATA SHEET**

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____

REMARKS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

15. DATA SHEETS....Continued

DATA SHEET 8

TEST EQUIPMENT LIST

VEH. MOD YR/MAKE/MODEL/BODY: _____

VEH. NHTSA NO.: _____ ; VIN: _____

VEH. BUILD DATE: _____ ; TEST DATE: _____

TEST LABORATORY: _____

OBSERVERS: _____

ITEM	MFR	MODEL	S/N	CALIB. PERIOD	DATE OF LAST CALIB.	ACCURACY	REMARKS

REMARKS:

RECORDED BY: _____ DATE: _____

APPROVED BY: _____

16. FORMS**LABORATORY NOTICE OF TEST FAILURE TO OVSC**

FMVSS NO.: 216 TEST DATE: _____

LABORATORY: _____

CONTRACT NO.: _____; DELV. ORDER NO.: _____

LABORATORY PROJECT ENGINEER'S NAME: _____

TEST VEHICLE MODEL YEAR/MAKE/MODEL/BODY STYLE: _____

VEHICLE NHTSA NO.: _____; VIN: _____

MFR: _____; BUILD DATE: _____

TEST FAILURE DESCRIPTION: _____

FMVSS REQUIREMENT, PARAGRAPH ____ : _____

NOTIFICATION TO NHTSA (COTR) : _____

DATE: _____ BY: _____

REMARKS: _____

16. FORMS....Continued

MONTHLY TEST STATUS REPORT**FMVSS 216****DATE OF REPORT: _____**

NO.	VEHICLE NHTSA NO., MAKE & MODEL	COMPLIANCE TEST DATE	PASS/ FAIL	DATE REPORT SUBMITTED	DATE INVOICE SUBMITTED	INVOICE PAYMENT DATE
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

16. FORMS....Continued

MONTHLY VEHICLE STATUS REPORT**FMVSS 216****DATE OF REPORT: _____**

NO.	VEHICLE NHTSA NO., MAKE & MODEL	DATE OF DELIVERY	ODOMETER READING	TEST COMPLETE DATE	VEHICLE SHIPMENT DATE	ODOMETER READING
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						